

CLAIMS

1. A primary alkaline battery, comprising:
a cathode comprising a cathode active material and more than about 5% of carbon fibers by weight;
an anode;
a separator; and
an alkaline electrolyte.
2. The battery of claim 1, wherein the cathode comprises more than about 6% of carbon fibers by weight.
3. The battery of claim 1, wherein the cathode comprises more than about 7% of carbon fibers by weight.
4. The battery of claim 1, wherein the cathode comprises more than about 8% of carbon fibers by weight.
5. The battery of claim 1, wherein the cathode comprises more than about 9% of carbon fibers by weight.
6. The battery of claim 1, wherein the cathode comprises between about 5% and about 10% of carbon fibers by weight.
7. The battery of claim 1, wherein the cathode comprises between about 5% and about 7% of carbon fibers by weight.
8. The battery of claim 1, wherein the cathode active material comprises manganese dioxide.
9. The battery of claim 1, wherein the cathode comprises less than about 90% of cathode active material by weight.

10. The battery of claim 1, wherein the cathode comprises less than about 88% of cathode active material by weight.

11. The battery of claim 1, wherein the cathode comprises between about 82% and about 92% of cathode active material by weight.

12. The battery of claim 1, wherein the cathode comprises between about 84% and about 90% of cathode active material by weight.

13. The battery of claim 1, wherein the carbon fibers have an average diameter less than about 300 nanometers.

14. The battery of claim 1, wherein the carbon fibers have an average diameter between about 100 nanometers and about 250 nanometers.

15. The battery of claim 1, wherein the carbon fibers have an average diameter less than about 250 nanometers.

16. The battery of claim 1, wherein the carbon fibers have been heat treated.

17. The battery of claim 16, wherein the carbon fibers have been heat treated at a temperature greater than about 2000 °C.

18. The battery claim 16, wherein the carbon fibers have been heated treated at a temperature between about 2600 °C and about 3100 °C.

19. The battery of claim 1, wherein the carbon fibers have a length less than about 2×10^5 nanometers.

20. The battery of claim 1, wherein the carbon fibers have an average length between about 500 nanometers and about 200,000 nanometers.

21. The battery of claim 1, wherein the carbon fibers have an average length between about 70,000 nanometers and about 100,000 nanometers.

22. The battery of claim 1, wherein the carbon fibers have between about 1 and about 500 layers of graphite.

23. The battery of claim 22, wherein the carbon fibers have between about 40 and about 100 layers of graphite.

24. The battery of claim 1, wherein the carbon fibers have an average external surface area between about $10 \text{ m}^2/\text{g}$ and about $50 \text{ m}^2/\text{g}$.

25. The battery of claim 1, wherein the carbon fibers have a surface energy between about $50 \text{ mJ}/\text{m}^2$ and about $300 \text{ mJ}/\text{m}^2$.

26. The battery of claim 1, wherein the carbon fibers have a graphitic index of less than about 85%.

27. The battery of claim 1, wherein the carbon fibers have an average length equal to or greater than an average particle size of the cathode active material.

28. The battery of claim 1, wherein the cathode further comprises a surfactant.

29. The battery of claim 28, wherein the surfactant is selected from a group consisting of polyvinyl alcohol, ethylene-vinyl alcohol, and polyvinylbutyrol.

30. The battery of claim 1, wherein the anode comprises zinc as an anode active material.

31. A primary alkaline battery, comprising:
a cathode comprising manganese dioxide and more than about 5% by weight of heat-treated carbon fibers having an average diameter less than about 300 nanometers;
an anode;

a separator; and
an alkaline electrolyte.

32. The battery of claim 31, wherein the cathode comprises between about 5% and about 10% of carbon fibers by weight.

33. The battery of claim 31, wherein the cathode comprises between about 5% and about 7% of carbon fibers by weight.

34. The battery of claim 31, wherein the cathode has an electrical conductivity at least 3 times greater than a cathode having about 6% of graphite by weight.